ENDANGERED SPECIES ACT - SECTION 7
BIOLOGICAL OPINION

AND

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT CONSULTATION

SR 202: Tokul Creek Slide Repair, Snoqualmie River, King County Washington

(WSB-01-418)

Agency: Federal Highways Administration

Consultation Conducted By: National Marine Fisheries Service
Northwest Region
Washington Habitat Branch

Approved: F.r Michael R Crouse Date: April 15, 2002

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Regional Administrator

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1.0 INTRODUCTION

1.1 Consultation History

On March 21, 2001, the National Marine Fisheries Service (NMFS) received a Biological Assessment (BA) and request for formal section 7 consultation from the Federal Highways Administration (FHWA) through the Washington State Department of Transportation (WSDOT). Additional information necessary to complete the formal consultation was provided to NMFS on February 07, 2002. The agencies initiated consultation under section 7 of the Endangered Species Act (ESA) regarding a proposed slide repair project within Tokul Creek, which is a tributary to the Snoqualmie River within the Snohomish River watershed. The project is located within King County, Washington.

FHWA is a funding agency for this consultation, and WSDOT is FHWA's designated non-Federal representative. This funding provides a basis (a "federal nexus") for this consultation.

The FHWA has determined that Threatened Puget Sound Chinook salmon (*Oncorhynchus tshawytscha)* occur within the project area. The FHWA determined, and NMFS agreed, that the proposed actions were likely to adversely affect the indicated species. The effects determination was made using the methods described in Making ESA Determinations of Effect for Individual or Grouped Actions at the Watershed Scale (NMFS 1996).

This Biological Opinion (Opinion) reflects the results of the consultation process. The consultation process has involved correspondence and communication to obtain additional information and clarify the BA and associated documents provided to NMFS. FHWA has communicated regularly with NMFS and included suggested revisions to the BA. In addition, NMFS has visited the site and regularly communicated with WSDOT during this consultation.

The objective of this Opinion is to determine whether the proposed project is likely to jeopardize the continued existence of Puget Sound chinook salmon, or result in destruction or adverse modification of their designated critical habitat.

1.2 Description of the Proposed Action

FHWA proposes to fund WSDOT's construction project. The funds would enable WSDOT to stabilize a slope failure that may compromise the structural integrity of SR 202 if allowed to continue to erode. A summary of the proposed work follows.

Under ESA section 7 analysis, the action area is the area in which direct and indirect effects would arise. For the purposes of this Opinion, the action area is defined by NMFS as the project site, upstream to the Tokul Creek hatchery intake, and downriver into the Snoqualmie River to approximately River Mile (RM) 36.

Proposed work includes stabilizing the slope supporting SR 202 near Mile Post 25.0 by constructing a rock buttress 250 feet long and 180 feet wide. At the base of the slide, work will include the installation of an approximately 250-foot long temporary sheet pile wall on the east side of the creek, which will de-water the work area and isolate it from active flow. A 120-foot long and 12.5-foot wide temporary construction bridge will be placed across the channel to facilitate the transfer of construction equipment and materials to the project site. The sheet pile wall and temporary bridge will be removed in the low flow period (approximately July) of 2003. Sandbags may also be used to further divert water from the base of the construction area. Up to 35 logs will be anchored from 100 feet upstream of the King County Tokul Creek bridge to 350 feet down from the Washington State Department of Fish and Wildlife (WDFW) hatchery water diversion intake, with the purpose of enhancing post-project substrate stability.

Contractors will excavate the toe of the slide behind the sheet-pile wall to allow the placement of rock and up to 62 trees with rootwads intact, which will form 200 lineal feet of the toe of the revetment. A riparian buffer (width ranging from 5 to 25 feet) will be established with native vegetation immediately behind the revetment. From the top of the bank next to SR 202 down to the revetment, heavy and light loose rip rap will then be placed to a slope ranging from 1.69:1 to 1.25:1. Landslide materials on the left bank will not be removed or altered, with the exception of minor grading in order to install the temporary construction bridge. The total project area is 1.4 acres, of which 0.31 acres will be cleared, graded and revegetated. Some landslide material on the right bank will be removed to increase channel width, with the final width ranging from 50 to over 80 feet.

The project includes actions to be taken by the project applicant that will minimize effects of the project on the species under review by protecting or enhancing habitat functions that are affected by the project.

- All disturbed areas will be appropriately contained, seeded, fertilized, mulched, and/or replaced with native vegetation.

- All appropriate water quality Best Management Practices (BMPs), a Temporary Erosion and Sediment Control and Countermeasure Plan (TESCCP), and Spill Prevention Control and Countermeasure Plan (SPCCP), will be fully implemented.

- All trees will be removed in such a way that their rootwads and stem lengths remain intact. The trees will then be placed into the creek in locations approved by a WSDOT biologist.

- All construction activities will comply with water quality standards (RCW 940.48 and WAC 173-201A) set forth by the Washington State Department of Ecology (WDOE). The current WSDOT/WDOE Water Quality Implementing Agreement (WQIA) allows for a mixing zone distance of 300 feet downstream of the project not to be exceeded. If WSDOT anticipates this distance will be exceeded, WSDOT will seek a Temporary Water Quality Modification permit from WDOE.

- Turbidity monitoring will be conducted at three locations prior to and during construction. A background station will be located upstream of the project site, a construction station will be located immediately adjacent to the site, and a downstream station will be located within 300 feet of the site. WSDOT will follow the water quality criteria set forth in the WAC 173-201A-030 (2)(c)(vi), which stipulates that <5 NTU/background when background is ≤ 50 NTU, or ≤10 % increase when background is ≥50 NTU's.

Project Timeline

Work is scheduled to start in July 2002, with most work to be completed within 6 months. The sheet pile wall will be in place approximately one year. The Hydraulic Project Approval (HPA) issued by the Washington State Department of Fish and Wildlife (WDFW) allows in water work from July 1st through September 15th, 2002 and 2003.

2.0 ENDANGERED SPECIES ACT

2.1 Biological Information

The listing status, biological information, and critical habitat elements or potential critical habitat for the indicated species are described in Table 1.

Species (Biological Reference)	Listing Status Reference	Critical Habitat Reference
Chinook salmon from Washington, Idaho, Oregon and California, (Myers, *et al.* 1998).	The Puget Sound ESU is listed as Threatened under the ESA by the NMFS, (64 Fed. Reg. 14308, March 1999).	Designated Critical Habitat for the Puget Sound ESU, (65 Fed. Reg 7764; February 16, 2000.)

Table 1. References to Federal Register Notices containing additional information concerning listing status, biological information, and critical habitat designations for listed and proposed species considered in this biological opinion.

2.2 Evaluation of the Proposed Action

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 CFR Part 402 (the consultation regulations). NMFS must determine whether the action is likely to jeopardize the listed species and/or whether the action is likely to destroy or adversely modify critical habitat. This analysis involves the initial steps of (1) defining the biological requirements and current status of the listed species, and (2) evaluating the relevance of the environmental baseline to the species' current status.

Subsequently, NMFS evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NMFS must consider the estimated level of mortality attributable to: (1) collective effects of the proposed or continuing action, (2) the environmental baseline, and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed salmon's life stages that occur beyond the action area. If NMFS finds that the action is likely to jeopardize, NMFS must identify reasonable and prudent alternatives for the action.

Furthermore, NMFS evaluates whether the action, directly or indirectly, is likely to destroy or adversely modify the listed species' designated critical habitat. The NMFS must determine whether habitat modifications appreciably diminish the value of critical habitat for both survival and recovery of the listed species. The NMFS identifies those effects of the action that impair the function of any essential element of critical habitat. The NMFS then considers whether such impairment appreciably diminishes the habitat's value for the species' survival and recovery. If NMFS concludes that the action will adversely modify critical habitat it must identify any reasonable and prudent measures available.

Guidance for making determinations on the issue of jeopardy and adverse modification of habitat are contained in *The Habitat Approach, Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids*, August 1999 (Appendix I).

For the proposed action, NMFS' jeopardy analysis considers the extent of actual injury or death of fish attributable to habitat modifying actions. NMFS' critical habitat analysis considers the extent to which the proposed action impairs the function of essential elements necessary for migration and spawning of the listed salmon under the existing environmental baseline.

2.3 Biological Requirements

The first step in the method NMFS uses for applying the ESA section 7(a)(2) to listed salmon is to define the species' biological requirements that are most relevant to each consultation. NMFS also considers the current status of the listed species taking into account population size, trends, distribution and genetic diversity. To assess the current status of the listed species, NMFS starts with the determinations made in its decision to list Puget Sound chinook for ESA protection and also considers new data available that is relevant to the determination (see Table 1 for references).

The relevant biological requirements are those necessary for Puget Sound chinook to survive and recover to naturally reproducing population levels such that protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stock, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment.

Five general classes of features or characteristics determine the suitability of aquatic habitats for salmonids: flow regime, water quality, habitat structure, food (energy) source, and biotic interactions (Spence *et al*. 1996). For this consultation, flow regime, water quality, and habitat structure are features NMFS believes might be adversely affected for the short and long term as a result of this project.

2.4 Environmental Baseline

For the Puget Sound ESU of chinook salmon, the biological requirements for survival and recovery are not met under the existing environmental baseline. The current range-wide status of the Puget Sound ESU is referenced in Table 1, above. Their status requires improvement in environmental conditions throughout the ESU, including the condition of any designated critical habitat. Any further degradation of existing conditions would probably increase the risks to listed salmon under the existing environmental baseline.

Tokul Creek

Tokul Creek is a 13 mile long, 21,704 acre subbasin that enters the Snoqualmie River at RM 39.6 (Williams *et al*. 1975). Land in the upper watershed consist of forested areas, most of which have been logged within the past several decades. Suburban development continues to affect the watershed through the addition of impervious surfaces and associated impacts.

A WDFW hatchery is located adjacent to the creek as it enters the Snoqualmie River. The hatchery is located along approximately the lower 0.3 mile of the creek, and has essentially eliminated the creeks alluvial fan and channel migration zone throughout this stretch. The hatchery water diversion dam at RM 0.3 blocks chinook migration to the upper watershed. It is thought that up to 0.8 miles of suitable chinook spawning and rearing habitat is located above the dam, where a natural cascade may at times further block access to the rest of the watershed. The hatchery takes approximately 9 cubic feet per second from Tokul Creek (Rich Costello, WDFW, Pers. Comm. February 5, 2001). SR 202 is located on the slope to the east of the creek, and appears to be of full bench design (SR 202 was cut into the original slope rather than extensive fill in a side cast design). SR 202 does not have any stormwater quality or quantity controls within the slide area.

Above and below the barrier, the water diversion dam has influenced habitat quality. Bedload movement has likely been slowed upstream of the diversion, resulting in a decreased slope. Below the barrier and prior to the slide the lack of substrate replenishment from upstream likely resulted in downcutting of the creek.

The hatchery is located on extensive fill, most of which used be part of the natural channel migration zone of the creek. Historically, the slope of the creek in this area likely was relatively low, resulting in slower moving waters, sediment deposition and greater channel sinuosity (WSDOT 2001). Below the dam, the creek flows through a relatively narrow channel, with little ability to meander. With the exception of the slide area, riparian habitat on the east side of the

creek consist of native conifers and shrubs. The slide has deposited 5,000 to 8,000 cubic yards of sediment, gravel, cobbles, and trees into the creek. After the initial landslide in 1999 and subsequent slides as recently as winter 2001, the creek bed upstream of the material has aggraded up to five feet (Phil Jensen, WDFW, Pers. Comm. December 26, 2001).

The right (hatchery) bank of the creek has a small riparian zone consisting of alders, willows, and Himalayan Blackberry (*Rubus discolor*). The toe of the creek is riprapped to ensure structural integrity of the hatchery ponds. Wood is generally lacking in the lower portion of the creek because of reduced recruitment from the upper watershed, minimal west bank vegetation below the dam, and active in-creek removal. Until recently, wood was removed from the creek as it stacked on the dam. Studies of sediment levels above and below the slide reveal significant differences, DeVries *et al*. 2001 reported that artificial redds placed below the slide had greater quantities of intruded fines than upstream of the slide.

It is not known with certainty whether the land slide is a result of natural process, or anthropogenic factors including intentionally confining the creek to the eastern extreme of the historic channel migration zone, or undetained road drainage from SR 202. It is likely that the slide was exacerbated by a combination of the latter two factors. Washington State Department of Ecology (WDOE) staff have observed SR 202 drainage discharged at the upper extreme of the slide (Bob Penhale, WDOE, Pers. Comm. December 26, 2001). Over time this drainage might have undermined soil integrity within the slope. Further, the creek is not able to naturally adjust to the slide by meandering around the materials, as it historically would have been able to do. As a result, the creek channel has been confined to approximately 15 feet as it is forced to flow through the slide materials and the protected hatchery bank. Downstream of the slide, the creek gradient increases relative to the upstream portion.

Snoqualmie River

Similar to chinook habitat throughout the Puget Sound ESU, the Snoqualmie Basin has been significantly altered by over a century of human activities. The Snoqualmie River originates in the Cascade Range, although it does not contain glacial runoff. Its branches flow through mostly mountainous terrain for 35 miles to Snoqualmie Falls. Below the falls the river enters a relatively broad and flat valley floor for 36 miles to join the Skykomish, the middle and lower portions of which contain extensive agricultural land and increasing urban development. Numerous abandoned oxbows in the lower river are evidence of extensive lateral migration across the flood plain, though for the past 50 years the mainstem has not migrated significantly (Pentec 1999). This may be due to the removal of large scale logjams and limited large wood requitement due to riparian harvest of trees and bank hardening efforts. Approximately 64 percent (66 miles) of the river bank has minimal (a single line of trees) or no riparian vegetation, while 24 percent (25 miles) of river bank have been diked or leveed (Pentec 1999). Past clear cutting in the upper tributary reaches, basin wide development and road building have resulted in altered hydrologic regimes, excessive sediment loads to fish bearing waters and decreased summertime baseflows (Williams *et al*. 1975).

2.5 Status of the Species in the Action Area

Snohomish River Basin chinook have recently been delineated by the Puget Sound Technical Recovery Team (TRT 2001) into two separate populations, consisting of fish that spawn within the Skykomish and Snoqualmie Rivers.

Data is limited regarding historic population levels within the basin, although a 1970 study by the Pacific Northwest River Basins Commission stated that from 1956-1965 chinook returns (harvest plus escapement) ranged from 5,520 to 72,480, with an average of 30,720 fish. Escapement levels for the total river system averaged 5,250 fish from 1965-1976, and have declined 25 percent to an average of 4,013 fish from 1987-1998 (Snohomish Basin Salmonid Recovery Technical Committee (SBSRTC)1999).

Relative to the rest of the Puget Sound ESU, populations in the northern rivers, including the Snohomish, have shown the least amount of genetic influence from past hatchery releases (Myers *et al.* 1998).

Tokul Creek and Snoqualmie River Chinook

As table 2 indicates, over the past few decades Tokul Creek has the highest density of chinook redds within the Snohomish River Basin. Genetic testing has not been conducted on unmarked Tokul chinook to determine if they are genetically distinct from fish in the rest of the mainstem Snoqualmie and its tributaries.

Table 2. Top Five Peak Redd/Mile for Snohomish Basin Chinook, 1974-1998.

Stream Name	River Mile	Average Peak Redd/Mile
Tokul Creek	0.0 to 0.3	49.26
Sultan River	4.5 to 5.5	22.69
Sultan River	7.0 to 7.6	19.75
Snoqualmie River	23.0 to 24.9	19.62
Bridal Veil Creek	0.0 to 0.4	17.07

WDFW Unpublished Data.

Snoqualmie River chinook typically spawn in the mainstem roughly between RM 21 and RM 25 (Williams *et al*, 1975) and near Fall City (RM 35.5) (WDFW, Salmon and Steelhead Stock Inventory (SASSI) Report, 1992). Chinook also utilize most larger tributaries for spawning, including Griffin, and Cherry Creeks, and the Tolt and Raging Rivers. Chinook spawn throughout the accessible portion of Tokul Creek. In recent years, from 20 percent to 48 percent of the Tokul returns have been comprised of hatchery strays, though the Tokul Creek hatchery does not produce chinook. In order to provide opportunities for chinook spawning above the

slide area, for the past two years local volunteer groups have received State funding to capture and move adult fish above the water diversion dam. Many fish have been observed to volitionally return below the dam to spawn, and it is unknown how many redds have been constructed above. Adult and juveniles chinook heading downstream are at risk of harm from the inadequately screened water intake. Table 3 shows the relative contribution of returning Tokul chinook to the Snoqualmie population as a whole.

Table 2. **Estimated Chinook Returns Snoqulamie River Basin, 1997-1999.**

	1997	**1998**	**1999**
Snoqualmie River*	1,959	1,812	997
Tokul Creek (Hatchery Strays)**	83 (16)	80 (39)	347 (132)

Data represents estimations based upon information gathered by WDFW, the Tulalip Tribes and others (Rawson, unpublished data). *Total River returns excluding Tokul Creek. **Most strays were found to be from the Wallace Falls hatchery on the Skykomish River, and the Tulalip Tribal hatchery in Port Gardiner, Puget Sound.

Snohomish River Chinook Life History

Chinook salmon display a greater amount of life history variation than other anadromous Pacific salmonids. One of the habitat utilization variables that can have a tremendous amount of diversity is the amount of time that juvenile chinook spend in fresh water and brackish estuary environments (Myers *et al.* 1998).

Chinook in the Snohomish River system are broadly characterized as typically displaying two dominate life history strategies (SBSRTC 1999; Pentec 1999). After emergence from redds,"ocean-type" chinook typically spend from one to three weeks in freshwater habitats before moving to the estuary and spending from one to six months, then moving to the nearshore of Puget Sound and the Pacific Ocean. "Stream-type" chinook typically remain in freshwater environments for up to a year or more before entering the saltwater environment, thus freshwater rearing habitat is particularly important for stream-type fish.

Although annual variations likely occur, it has been estimated that 25 percent to 33 percent of Snohomish chinook display stream-type life history characteristics (SBSRTC 1999). These estimates are mirrored by a 1993 study by Kirby (1995) in the Snohomish estuary in which it was extrapolated that 25 percent of that years juvenile chinook in the mainstem and sloughs were classified as yearling (stream-type) chinook. Juvenile chinook have been documented to reside several weeks to several months in the various portions of the mainstem and sloughs (Regenthal 1954; Tulalip Tribes 1986, 1987).

2.6 Factors Affecting Species in the Action Area

Section 4(a)(1) of the ESA and NMFS listing regulations (50 CFR part 424) set forth procedures for listing species. The Secretary of Commerce must determine, through the regulatory process, if a species is endangered or threatened based upon any one or a combination of the following factors: (1) The present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; or (5) other natural or human-made factors affecting its continued existence.

NMFS has prepared two supporting documents which address the factors that have led to the decline of chinook salmon and other salmonids. The first is entitled ‘‘Factors for Decline: A Supplement to the Notice of Determination for West Coast Steelhead’’ (NMFS, 1996). That report concluded that all of the factors identified in section 4(a)(1) of the ESA have played a role in the decline of steelhead and other salmonids, including chinook salmon. The report identifies destruction and modification of habitat, overutilization for commercial and recreational purposes, and natural and human-made factors as being the primary reasons for the decline of west coast steelhead, and other salmonids including chinook salmon. The second document is a supplement to the document referred to above. This document, entitled ‘‘Factors Contributing to the Decline of West Coast Chinook Salmon: An Addendum to the 1996 West Coast Steelhead Factors for Decline Report’’ (NMFS 1998) discusses specific factors affecting chinook salmon. In this report, NMFS concludes that all of the factors identified in section 4(a)(1) of the ESA have played a role in the decline of chinook salmon, and other salmonids. The report identifies destruction and modification of habitat, overutilization for recreational purposes, and natural and human-made factors as being the primary reasons for the decline of chinook salmon.

The proposed action includes activities that would have some level of effects with short-and long term results from the first category above. The extent and duration of such effects and conclusions regarding the consequences of those effects on Puget Sound chinook salmon are provided below.

2.7 Effects of the Proposed Action

Analytically, this section is organized into direct, short term effects, and indirect, longer-term effects. The description of short term effects includes the beneficial effects of elements of project design, construction staging, and construction methods that were incorporated into the project to address adverse direct effects.

2.7.1 Direct Effects

Direct effects are immediate effects of the project on the species or its habitat (50 CFR 402.02). Under the proposed action, adverse direct effects on chinook salmon and their habitat will likely result during the slide abatement project. Chinook biological requirements affected by the project include flow regime, water quality, and structural habitat condition. Potential effects

include sediment mobilization, redd scour, and equipment spills. Other short term effects include the beneficial effects of elements of project design, construction staging, and construction methods that were incorporated into the project to minimize adverse direct effects.

Sediment Mobilization and Deposition

Sediment will be mobilized during the construction activities. The driving of the sheet piles and excavation of landslide materials represent the most significant causes of sedimentation. Riprap may also inadvertently fall into the Creek as it is distributed along the slope. The effects of sediment on salmonids are well documented, high concentrations of suspended sediment can delay and/or divert spawning runs and in some instances can cause avoidance by spawning salmon (Smith 1939, Servizi *et al.*1969, Mortensen *et al.*, 1976).

The effects of sediment mobilization as a result of construction activities may be difficult to quantify relative to the background condition. In-water work will be completed during summer low flows, when most adult or juvenile chinook are not present in the creek. Although adverse effects from fine sediment mobilization will likely occur, they will not last past the duration of the project construction. It is anticipated that fine sediment mobilization will largely be minimized as a result of the proposed BMPs. As such, long term adverse effects from chronic fine sediment introduction from construction are unlikely.

Redd Scour and Chinook Disturbance

Adult chinook typically construct redds immediately adjacent to where the sheet pile wall will be installed (WSDOT 2001). Although construction activities may discourage some fish from spawning immediately adjacent to the site, there will likely be redds near the sheet pile wall nonetheless. As winter flow volumes and velocities increase, the creek will be constrained by the vertical wall, resulting in scour at its base and elsewhere in the creek. This process will result in complete and partial redd scour, depending on their location and the relative flows throughout the redd incubation period.

Equipment Spills

The presence of equipment creates some risk of fuel oil spill or introduction of other chemicals in the action area. Therefore, as part of the project, WSDOT has submitted a SPCCP, referred to in the description of the proposed action section of this Opinion. If properly implemented, the SPCCP plan will minimize the potential for adverse effects to occur. The HPA issued by WDFW to WSDOT contains provisions to further minimize effects on chinook and their designated critical habitat.

2.7.2 Indirect Effects

Indirect effects are those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur (50 CFR 402.02) for infrastructure projects such as the underlying proposal by WSDOT. Longer-term effects of the proposed project have been assessed based on WSDOT's BA and associated documents provided to NMFS.

Elimination of Slide Materials

Mass-wasting events are part of the natural disturbance regime of coastal and Puget Sound watersheds (Naimen *et al.* 1992 and Swanson *et al*. 1987). Periodic natural disturbances replenish large wood, sediment, cobbles and gravels in streams at natural intervals ranging from decades to several centuries (Reeves *et al*. 1995). Localized effects on stream habitat from these episodic events diminish through time as the hydrologic process erodes and redistributes materials, systematically sustaining habitat. Although sediment of various sizes and quantities is a natural feature of aquatic habitats in which chinook have evolved, the relative sediment budgets of many watersheds and subbasins within the Snoqualmie Basin have been altered from anthropogenic activities including logging, road building and development (Williams *et al*. 1975). As a result, sediment has likely been delivered in larger quantities and more frequently to habitats that support anadromous species.

The Tokul slide has likely reduced spawning habitat quality for the lower portion of the creek through several mechanisms. Fine sediment can act as a physical barrier to fry emergence, numerous studies have found that fines (>13% of sediments < 0.85mm) result in intragravel mortality of salmonid embryos due to oxygen stress and metabolic waste build-up (Cooper 1959; 1965; Wickett 1958; McNeil and Ahnell 1964; Koski 1972; McHenry *et al*. 1994). Deposited sediment can cover intragravel crevices which juvenile salmonids use for shelter, in turn decreasing the carrying capacity of streams for juvenile salmon (Cordone and Kelley 1961, Bjornn *et al.* 1974). Particulate materials have been documented to physically abrade and mechanically disrupt respiratory structures (fish gills) and respiratory epithelia of benthic macroinvertebrates (Rand and Petrocelli, 1985).

Fine sediment adversely affects benthic organisms, a juvenile chinook prey source. Fine sediment can reduce accessibility to microhabitats by embedding the edges of gravel and cobbles (Brusen and Prather 1974), and entomb benthic organisms, which then die due to depleted supplies of dissolved oxygen. When fine sediment is deposited on gravel and cobble, benthic species diversity and densities have been documented to drop significantly (Cordone and Pennoyer 1960; Herbert *et al.* 1961; Bullard 1965; Reed and Elliot 1972; Nuttall and Bilby 1973; Bjornn *et al.* 1974; Cederholm *et al.* 1978).

Sediment deposition can lead to decreased levels of dissolved oxygen (DO). In addition to the potential lethal effects of low DO, sublethal effects can be manifested in juvenile salmonids. Bjornn and Reiser (1991) determined that growth and food conversion efficiency are affected at

DO levels of less than 5mg/L. Phillips and Campbell (1961) determined that DO levels must average greater that 8mg/L for embryos and alevins to have good survivability rates. Silver *et al.*(1963) and Shumway (1964) observed that chinook reared in water with low or intermediate oxygen levels were smaller sized and had a longer incubation period than those raised at high DO levels. Low DO levels have been observed to increase the incubation periods for anadromous species, and decrease the size of alevins (Garside 1966, Doudoroff and Warren 1965, Alderdice *et al.* 1958).

Spawning chinook below the slide are subject to elevated velocities and sediment levels, both of which likely compromise emergence rates of alevins. The elimination of this chronic sediment supply will over time enhance redd emergence rates downstream of the slide through the eventual decrease of the adverse effects of elevated sediment levels described above.

The slide repair will prevent the regeneration of trees along the hillside after it would have naturally stabilized. It will also eliminate the continued introduction of cobbles and gravels suitable for spawning, which would in turn benefit spawning in the mainstem Snoqualmie River. The wood revetment, placement of wood throughout the creek and riparian area will reduce the effects of the loss of future wood recruitment to the creek as a whole. Given the creeks inability to adjust to the slide through redirection of flow, over the long term the slide repair will enhance habitat conditions in the creek.

Redd Scour

After the slide project is completed and the sheet piles are removed, the creek bed will begin to adjust to the physical changes related to the slide abatement. The dynamic nature of the creek within the next several years may lead to unstable substrate conditions affecting chinook redds in the creek. With the landslide material supply eliminated, the creek will likely begin to re-grade by downcutting throughout the upper and middle portions of its 0.3 mile length below the hatchery water diversion. Initially, most bedload movement will originate near the upstream portion of the revetment because the slide will no longer introduce new material which would continue to function as a grade control. Depending upon the size and frequency of flow events, this process will likely occur over a period of several years until the creek reaches a state of relative equilibrium. The most significant bedload movement will occur during higher flows, which typically occur November through June in the Snohomish basin. These higher flow periods coincide with egg incubation within Tokul Creek, and as a result, egg to fry survival will be compromised within some redds, and others may suffer complete mortality through scour. After the creek bed equilibrates, this reach of Tokul Creek will continue to provide appropriate spawning and rearing habitat for chinook.

Wood Placement

Longer term effects from the placement of wood in the creek and the slide revetment with rootwads are likely to be beneficial to chinook and their habitat. The anticipated downcutting of the creek will be slowed through the retention of larger sediment, cobbles and gravels. The

wood should increase coarse sediment, gravels, cobbles and nutrient storage, all of which have been documented as effects of wood accumulations (Bisson *et al*. 1987). In turn, substrate redistribution as a result of downcutting will be slowed. Other beneficial effects resulting from improved channel morphology include increased holding and rearing habitat for adult and juvenile salmonids, and sediment and organic debris trapping.

Scour pools of various sizes and depths will develop adjacent to the wood and as a result, holding habitat will develop. Wood accumulations may create conditions where temperature stratification and the development of thermal refugia occur (Bilby 1984; Nielson *et al.* 1994). Although difficult to quantify or detect, greater amounts of cold water holding habitat available to adult chinook may facilitate energy conservation, thus potentially saving energy for redd construction, spawning and redd guarding.

In addition to adult use, the wood will also provide habitat components beneficial to juvenile salmonids. Juvenile chinook often utilize stream margin habitats, where water velocity is typically slower than other micro-habitats (Lister and Genoe 1970; Bjornn and Reiser 1991). Wood will decrease water velocities immediately adjacent to each piece, and will provide increased micro-habitat complexity preferred by juvenile salmonids. Large wood accumulations and associated pool habitats also provide cover from predators and refuge habitats during larger flow events (Everest *et al.* 1985).

2.7.3 Effects on Critical Habitat

NMFS designates critical habitat for a listed species based on physical and biological features that are essential to that species. Essential features for salmonid critical habitat include substrate, water quality, water quantity, water temperature, food, riparian vegetation, access, water velocity, space and safe passage (*i.e.,* several of the pathways referenced in the MPI). For most of the activities under the proposed project, NMFS expects that the effects will tend to maintain or restore properly functioning conditions in the watershed over the long term.

Over the short term, bedload mobilization will compromise chinook redd emergence rates through the sheet pile wall, and after the slide repair is completed. Despite the elimination of future recruitment of gravels to the creek, and tree growth on the hillside, the elimination of chronic introduction of sediments will provide net benefits to the creek. The slide revetment itself will offer enhanced refuge habitat near the 62 rootwads, and the establishment of native shrubs and trees. The placement of 35 pieces of wood will also provide immediate benefits to critical habitat.

2.7.4 Cumulative Effects

Cumulative effects are defined in 50 CFR 402.02 as "those effects of future State or private activities, not involving Federal Activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." For the purposes of this analysis, cumulative effects for the general action area are considered. Future Federal actions, including the on-going

operation of hatcheries, harvest, select transportation projects and land management activities will be reviewed through separate section 7 process.

Land use and activities within the action area consist mostly of residential development and associated land clearing, with some forestry. Most of the action area is located in unincorporated King County and the Snoqualmie Urban Growth Area (UGA) (BA WSDOT 2001). The King County Comprehensive Plan 2000 (KCCP) limits developments within the action area to one residential unit per 10 acres. Much of the land in the action area is located within the 100-year floodplain for the Snoqualmie River, where private development is generally not permitted (WSDOT 2001). Washington State Department of Natural Resources staff have stated that no forest practice permits have been issued within the action area recently (WSDOT 2001). King County has permits pending for miscellaneous single family residential construction within the action area (WSDOT 2001). NMFS believes the majority of environmental effects related to future growth will be linked to land clearing, associated use shift (i.e. from forest to lawn/pasture) increased impervious surface, and related changes. Further, NMFS believes that the existing local and State regulatory mechanisms to minimize and avoid impacts to watershed function and listed species from future commercial, industrial and residential development are generally not adequate, and/or not implemented sufficiently. Thus, while these existing regulations might in various circumstances decrease adverse effects to watershed function, they still allow incremental degradation to occur, which accumulate over time, and when added to the degraded environmental baseline will result in habitat conditions that further reduce habitat quantity and quality for listed species.

The effects of impacts on baseline conditions is partly dependent on discussions at the state and federal level about and Growth Management Act rules and regulations as they are related to land use. Therefore, in consideration of the above, NMFS believes that baseline conditions within the action area will be subject to significant changes in the short and long term.

Until improvements in non-federal land management practices are actually implemented, NMFS assumes that future private and State actions will continue at similar intensities as in recent years. Now that the Puget Sound chinook ESU is listed under the ESA, NMFS assumes that non-federal land owners, and permitting entities who have control to condition permits/deny permits to achieve watershed protection and enhancement in those areas, will also take steps to curtail or avoid land management practices and permitting that would result in the take of the those species. Such actions are prohibited by section 9 of the ESA, and are subject to the incidental take permitting process under section 10 of the ESA.

2.8 Conclusion

NMFS has determined based on the available information, that the effects of the proposed action are not likely to jeopardize the continued existence of Puget Sound chinook salmon. NMFS used best available scientific and commercial data in this analysis. The analysis was completed by comparing the expected effects of the proposed action on elements of the species' biological requirements, together with cumulative effects, to the environmental baseline. NMFS applied

the watershed-based evaluation methodology (NMFS 1996) to the proposed action and found that it would cause some reduced function degradation of chinook habitat. These adverse effects would be balanced in the long-term with the elimination of a large source of chronic fine sediment levels, reestablishment of riparian vegetation and placement of wood within the creek. Consequently, the net effects of this project would not result in destruction or adverse modification of critical habitat.

2.9 Incidental Take Statement

Sections 4 (d) and 9 of the ESA prohibit any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) of listed species without a specific permit or exemption. Harm is defined by NMFS as "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding and sheltering" (50 CFR 222.102). Harass is defined as actions that create the likelihood of injuring listed species to such an extent as to significantly alter normal behavior patterns which include, but are not limited to, breeding, feeding, and sheltering. Incidental take is take of listed animal species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

2.9.1 Amount or Extent of the Take

The NMFS is reasonabley certain that incidental take of Puget Sound Chinook salmon could result from project activities as described in this Opinion. Despite the use of the best scientific and commercial data available, NMFS cannot estimate a specific amount of incidental take of individual fish or incubating eggs. However, the mechanisms of expected effects are explained below. The extent to which these mechanisms may result in effects on salmon or salmon habitat can be described qualitatively, enabling reinitiation of consultation if such effects are exceeded during the project.

NMFS believes there are several mechanisms by which take may occur. During the course of the construction, sediment mobilization through earth clearing, wood placement and sheet pile placement may adversely affect chinook. This potential for take can be greatly reduced by the proper implementation of BMPs designed to reduce sediment mobilization, and following the SCCP for hazardous materials. Construction activities may displace adult chinook from preferred habitats. During the year that construction activities occur, there will be a

redistribution of river substrate near the sheet pile wall. Any chinook redds in this reach may be affected in the construction year as the creek adjusts to the new localized geomorphology.

Furthermore, NMFS expects some level of take as a result of the indirect effects of the project. After project construction, bedload redistribution and stream downcutting will impact redds throughout the accessible portion of the creek. As detailed above, these effects will result in lost redds and decreased emergence rates.

2.9.2 Reasonable and Prudent Measures

The NMFS believes that the following reasonable and prudent measures (RPMs) are necessary and appropriate to minimizing take of the Puget Sound ESU of chinook salmon. These RPMS are integrated into the BA and proposed project, and NMFS has included them here to provide further detail as to their implementation. These measures described below are non-discretionary. They must be implemented as binding measures for the exemption in section 7(a)(2) to apply. The FHWA has the continuing duty to regulate the activities covered in the incidental take statement. If the FHWA fails to require WSDOT to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit, or fails to retain the oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(a)(2) may lapse.

The following RPMs are applicable to FHWA:

1. The FHWA will minimize take by using best management practices that avoid and minimize construction related effects on riparian habitat and water quality.

2. The FHWA will minimize take by avoiding spills of hazardous materials.

3. The FHWA will minimize take by complying with the provisions of the HPA issued by WDFW.

4. The FHWA will minimize take by removing any construction material (angular rock) that inadvertently lands in the creek during project construction.

5. The FHWA will minimize take by limiting the removal and redistribution of slide materials waterward of the sheet pile wall.

6. The FHWA will minimize take by limiting the removal of wood encountered during the installation of the sheetpile wall.

2.9.3 Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, FHWA must comply with the following terms and conditions, which implement the reasonable and prudent measures

described above. These terms and conditions are non-discretionary. Again, although the action agency is responsible for minimizing take under this statement, WSDOT and its contractors will carry out the underlying construction activities. Therefore, the Terms and Conditions have been expressed in terms of WSDOT's activities.

2.9.3.1. The FHWA will implement RPM #1, above, through the use of best management practices that will be conducted throughout the course of the project, and that will be adjusted, monitored and maintained to avoid/minimize the delivery of sediment to surface waters. BMPs will be integrated into construction specifications as described in more detail in the BA and summarized above.

2.9.3.2. The FHWA will implement RPM #2, above, by ensuring that the SPCCP is in place before beginning the project. Hazardous materials must be handled to minimize the risk to aquatic and riparian habitats. The SPCCP will be prepared as a requirement of the NPDES permit that will be secured for the project.

2.9.3.3. The FHWA will implement RPM #3, above, by ensuring that the provisions of the HPA issued by WDFW are completed within designated time frames and to applicable performance standards. These include project timing, construction methods, equipment limitations, water quality BMPs to minimize impacts from construction, and appropriate revegetation standards.

2.9.3.4. The FHWA will implement RPM #4, above, by ensuring that in the event of this occurrence, the removal of construction materials will be done in coordination with WDFW, United States Fish and Wildlife Service and NMFS to ensure proper timing and methods.

2.9.3.5. The FHWA will implement RPM #5, above, by ensuring that removal or redistribution of the slide materials waterward of the sheetpile wall be limited to the width of the temporary access road and other areas necessary for construction access. If any wood is encountered and must be moved, it shall be redistributed with rootwads intact within the stream or on adjacent stream banks.

2.9.3.6. The FHWA will implement RPM #5, above, by ensuring that trees that must be moved in order to install the sheet pile wall be redistributed with rootwads intact within the creek or on adjacent stream banks.

2.9.4 Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a propose action on listed species or critical habitat, to help implement recovery plans, or to develop additional information.

The FHWA and WSDOT should assist WDFW to provide fish passage above the hatchery water intake, and bio-engineer the hatchery bank. Such actions would be consistent with section 7 (a)(1) of the ESA, and enhance baseline conditions within Tokul Creek.

NMFS must be kept informed of actions minimizing or avoiding adverse effects, or those that benefit listed species or their habitat. Accordingly, NMFS requests notification of the implementation of any conservation recommendations.

2.9.5 Reinitiation of Consultation

Consultation must be reinitiated if: the amount or extent of taking specified in the Incidental Take Statement is exceeded, or is expected to be exceeded; new information reveals effects of the action may affect listed species in a way not previously considered; the action is modified in a way that causes an effect on listed species that was not previously considered; the conservation measures are not carried out as described or, a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16). NMFS will be monitoring the listed Terms and Conditions of the Incidental Take Permit. NMFS may reinitiate consultation if the above measures are not adequately completed, resulting in enhanced potential for "take" to listed species. To re-initiate consultation, the FHWA must contact the Habitat Conservation Division, Washington Habitat Branch Office of NMFS.

3.0 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Background

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance Essential Fish Habitat (EFH) for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§305(b)(2));
- NMFS must provide conservation recommendations for any Federal or State action that would adversely affect EFH (§305(b)(4)(A));
- Federal agencies must provide a detailed response in writing to NMFS within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NMFS EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (§305(b)(4)(B)).

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting this definition of EFH: Waters

include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.10). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*e.g.*, contamination or physical disruption), indirect (*e.g.*, loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

EFH consultation with NMFS is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

The objectives of this EFH consultation are to determine whether the proposed action would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH.

3.2 Identification of EFH

Pursuant to the MSA the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of federally-managed Pacific salmon: chinook (*Oncorhynchus tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*) (PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC 1999), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based, in part, on this information.

3.3 Proposed Actions

The proposed action and action area are detailed above in Section 2.2 of this document. The action area includes habitats that have been designated as EFH for various life-history stages of chinook, coho and Puget Sound pink salmon.

3.4 Effects of Proposed Action

As described in detail in Sections 2.7.1 and 2.7.2 of this Opinion, the proposed action may result in short and long-term adverse effects to a variety of habitat parameters. These adverse effects are:

3.4.1. As described in section 2.7.1, in water work will have short term sedimentation impacts in the project area. The affects of sediment on salmonids are well documented, high concentrations of suspended sediment can delay and/or divert spawning runs and in some instances can cause avoidance by spawning salmon (Smith 1939, Servizi *et al*.1969, Mortensen *et al*., 1976). Equipment spills may also occur in the work area.

3.4.2. As described in section 2.7.2, Tokul Creek will likely undergo significant bedload mobilization after the project is complete. As a result, emergence rates from redds may be compromised.

3.5 Conclusion

NMFS concludes that the proposed action would adversely affect designated EFH for chinook, coho and Puget Sound pink salmon.

3.6 EFH Conservation Recommendations

Pursuant to Section 305(b)(4)(A) of the MSA, NMFS is required to provide EFH conservation recommendations to Federal agencies regarding actions that would adversely affect EFH. While NMFS understands that the conservation measures described in the BA will be implemented by FHWA and WSDOT, it does not believe that these measures are sufficient to address the adverse impacts to EFH described above. Consequently, NMFS recommends that the FHWA and WSDOT implement the following conservation measures to minimize the potential adverse effects to EFH for Pacific salmon.

3.6.1. Adopt Terms and Conditions 1 and 2, as described is section 2.9.3, to minimize EFH adverse affects #1.

3.6.2. The FHWA and WSDOT should assist WDFW to provide fish passage above the hatchery water intake, and bio-engineer the hatchery bank. These actions would allow fish to access habitat with more stable substrate relative to the reach adjacent to the project. Bio-engineering the bank would enhance riparian functions and potentially lead to less substrate scour by widening the stream width. These actions would minimize EFH adverse affects #2.

3.7 Statutory Response Requirement

Pursuant to the MSA (§305(b)(4)(B)) and 50 CFR 600.920(j), Federal agencies are required to provide a detailed written response to NMFS' EFH conservation recommendations within 30 days of receipt of these recommendations. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. In the case of a response that is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

3.8 Supplemental Consultation

The FHWA and WSDOT must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR 600.920(k)).

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Phone Conversation, February 5, 2001; Dan Tonnes, NMFS and Rich Costello, WDFW. Subject: Surface water intake quantities associated with the Tokul Creek hatchery.

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